

AMERICAN MUSEUM
Novitates

PUBLISHED BY
THE AMERICAN MUSEUM
OF NATURAL HISTORY

CENTRAL PARK WEST AT 79TH STREET
NEW YORK, N.Y. 10024 U.S.A.

NUMBER 2600

JULY 13, 1976

WILLIAM A. SHEAR

The Milliped Family Conotylidae
(Diplopoda, Chordeumida)
Revision of the Genus *Taiyutyla*,
With Notes on Recently Proposed Taxa

AMERICAN MUSEUM *Novitates*

PUBLISHED BY THE AMERICAN MUSEUM OF NATURAL HISTORY
CENTRAL PARK WEST AT 79TH STREET, NEW YORK, N.Y. 10024

Number 2600, pp. 1-22, figs. 1-42

July 13, 1976

The Milliped Family Conotylidae (Diplopoda, Chordeumida) Revision of the Genus *Taiyutyla*, With Notes on Recently Proposed Taxa

WILLIAM A. SHEAR¹

ABSTRACT

The milliped family Conotylidae Cook is divided into four subfamilies: Conotylinae Cook, Austrotylinae (new), Lophominae Loomis and Schmitt, and Macromastinae Loomis and Schmitt, the last originally proposed as an independent family. A key to the subfamilies and their included genera is presented. The genus *Taiyutyla* (Conotylinae) is revised, and nine new species are described: *clatsop*, *benedictae*, *simplex*, *trifurca*, *prefemorata*, *variata*, *millicoma*, *lewisi*, and *clarki*. *Conotyla extorris* Shear is transferred to *Taiyutyla*. New observations and illustrations are presented of the gonopods of *Macromastus marginandus* Loomis and Schmitt; the gonopod appears to have one less articulation than the original authors observed. *Troglotyla*

skamania Causey is transferred to *Lophomus* (Lophominae). *Corypus cochlearis* Loomis and Schmitt is transferred from the Conotylinae to the Austrotylinae. *Brunsonia complexipes* Loomis and Schmitt is synonymized with *Conotyla albertana* Chamberlin. Three *nomina dubia* in the Conotylidae [*Cookella leibergi* (Cook and Collins), *Zygotyla phana* Chamberlin, and "Trichopetalum" *glomeratum* Harger] are discussed. *Endopus parvipes* Loomis and Schmitt and *Orthogmus oculatus* Loomis and Schmitt, described in the family Trichopetalidae, were based upon immature conotylids; their status cannot be settled without mature material from the type localities.

INTRODUCTION

My 1971 revision of the milliped family Conotylidae was, as stated then, based on relatively few specimens from scattered localities. Since the publication of that paper, additional specimens and data have accumulated to the point that it has now become possible to issue a series of supplements to that original work. This third paper on the Conotylidae (see Shear 1971, 1974) deals with the western North American fauna.

In 1972, in the context of a reclassification of the New World Chordeumida, I added the family name Idagonidae Buckett and Gardner to the synonymy of the Conotylidae, and the evidence for that placement is to be found in that paper. Loomis and Schmitt (1971) described several new chordeumids related to or included in the family Conotylidae from western Montana. I have at last been able to borrow type material of

¹Research Associate, Department of Entomology, the American Museum of Natural History; Associate Professor, Department of Biology, Hampden-Sydney College, Hampden-Sydney, VA. 23942.

these forms and have suggested below some changes in the taxonomic positions of some of them.

Perhaps most significantly, hundreds of collections of millipedes made by Berlese extraction in Oregon and Washington by Mrs. Ellen M. Benedict have come into my hands. This material now makes possible a comprehensive restudy of the genus *Taiyutyla*, apparently endemic to the Pacific Northwest, west of the continental divide. *Taiyutyla* was established by Chamberlin in 1952 for *T. corvallis* Chamberlin, from Oregon. Hoffman (1961) studied some topotypical material, verified the validity of the genus as distinct from *Conotyla*, and suggested that *Conotyla jonesi* Chamberlin, described in 1951 from Oregon, was a possible synonym. Chamberlin retained the holotype of *T. corvallis* in his personal collection; the holotype of *C. jonesi* was to go to the British Columbia Provincial Museum, but they never received it. Neither could be located when I requested they be loaned in 1970.

Bollmanella was based by Chamberlin (1941) on the single species *B. oregonensis* Chamberlin, in a confusing series of paragraphs in which generic and specific diagnoses actually contradicted each other. In 1970, I borrowed the male holotype of *B. oregonensis* from the Chamberlin collection, through the courtesy of Mr. Thomas Lorenz, who was then in charge of it. *Bollmanella oregonensis* proved to be a distinctive conotyloid, and the material received from the Benedict collection added several additional species to the genus, which includes species related to, but readily distinguished from, species of *Taiyutyla* by the presence of a coxal flagellum on the posterior gonopods, uniform pregonopodal leg modifications, and generally smaller size (Shear, 1974). No species of *Bollmanella* are known as yet from California.

I express thanks to Mrs. Ellen M. Benedict, Portland State University, Portland, Oregon, for sending me the crucially important Berlese collections on which most of this and several subsequent papers will be based. I thank Dr. Ralph Crabbill, National Museum of Natural History, Smithsonian Institution, Washington, D.C., for the loan of type material.

I also thank the Faculty Research Committee of Hampden-Sydney College for financial support during this project, and Dr. Norman Plat-

nick of the American Museum of Natural History for his valuable comments on the manuscript.

ABBREVIATIONS

AMNH, the American Museum of Natural History

USNM, National Museum of Natural History,
Smithsonian Institution

PWAS, Personal Collection of William A. Shear

GONOPOD STRUCTURE AND FUNCTION

The structure of the gonopods of the genera treated below is typical of conotyloid millipedes. The anterior gonopods consist of single pieces representing a fusion of the coxa and telopodite of each leg, firmly articulated with a well-developed, chitinized, bandlike sternum that in some species extends along the lateral side of the gonopod, a tendency most clearly developed in species of *Austrotyla*. The posterior gonopods consist of three segments, of which the distal two are essentially similar in all known species, differing only in their proportions in some species populations. The basal, coxal segment bears colpocoxites of various forms that are crucial in species determinations. In species of *Taiyutyla*, the colpocoxites are simple or are apically bifurcate and may bear fimbriate regions or branches, or patches of tiny microsetae, about midway in their length. There is no articulate coxal flagellum present; in size the colpocoxites approximate the anterior gonopods. In related *Bollmanella* species (Shear, 1974), the posterior gonopod sternum is more strongly developed and in several species extends as a prominent T-shaped process between the coxae of the posterior gonopods. There is a basal coxal flagellum which, however, is not articulated, as it is in species of *Lophomus*. The main branch of the colpocoxite may be complex, and carries on its posterior surface a sheathing structure in which the coxal flagellum usually lies.

In both genera, the gonopods are positioned in the same way, a form shared by species of *Conotyla* and *Idagona*, although *Idagona* is quite aberrant. The gonopod complex is pushed posteriad so that the gonopods are nearly parallel to the long axis of the body. In this position, the tips of the anterior gonopods reach only to the middle of the posterior gonopod colpocoxites,

and are usually curved laterad and posteriad so that they pass lateral to the colpocoxites, forming on each side a sort of forceps-like arrangement (Shear, 1971).

The secondary sexual modifications of males of the western genera are essentially similar. Some of the pregonopodal legs are crassate and curved mesiad, and in species of *Taiyutyla*, posteromesial processes on some or all the femora are present. In species of *Bollmanella*, leg pairs three and four are enlarged, but the legs subsequently decrease in size so that pair seven is of nearly normal size. Only small femoral knobs appear on pairs three and four, if at all. My observations on the mating of *Conotyla blakei* in New England suggest that these are adaptations for grasping the head, antennae, and anterior segments of the female during copulation. The tenth and eleventh pairs of legs, just posterior to the gonopod complex, are also modified, and in the same way in all species of *Conotyla*, *Taiyutyla*, and *Bollmanella*. The tenth coxae are enlarged and bear an eversible gland; the trochanters are enlarged mesially in most species. The eleventh coxae and trochanters are usually essentially unmodified, but there is a long basal process on the eleventh prefemur in many species, which extends dorsomesiad nearly to the sternum. The functional significance of the eleventh leg modifications is not clear, but it does seem certain that the tenth coxal glands are used by the males to form spermatophores. Having available for the first time a large series of preserved male conotylids, I was able to verify a few sketchy observations about gonopod function made on living animals. Prior to or during mating, male conotylids probably flex the body so that the penes, opening through the coxae of the second legs, insert into the tenth coxal glands (perhaps the processes of the eleventh prefemora act as guides in this process) and therein discharge sperm. The glands add a secretion, in alcohol yellow-brown and hard, which forms up the sperm into spermatophores. Immediately before or during mating, the glands are extruded and the spermatophores are picked up by the forceps-like action of the anterior gonopods working against the posterior gonopod colpocoxites. I have found preserved males with extruded, spermatophore-tipped glands, and with spermatophores grasped in this fashion by the gonopods, always at the point

where the tips of the anterior gonopods cross lateral to the posterior gonopod colpocoxites. Probably the gonopods force the spermatophores into the cyphopods of the female. In some *Taiyutyla*, *Bollmanella*, and *Conotyla* species there is an obvious recessed glandular area in the coxal region of the anterior gonopods, with a channel that opens near the gonopod tip. Perhaps the apparatus produces a lubricating substance that aids in spermatophore transfer. The functional significance of the flagellum in species of *Bollmanella* and *Lophomus* remains obscure.

Unfortunately, it is difficult to draw any functional parallels in the female genitalia. These structures in conotylids show few differences between species, and, as yet, I have been unable to discover anything about them that would be taxonomically useful. The lack of nonsexual differences between species thus renders isolated female specimens virtually unidentifiable.

EVOLUTIONARY RELATIONSHIPS

Gonopod structure, as described above and in an earlier paper (Shear, 1971), clearly relates the genera *Conotyla*, *Taiyutyla*, *Plumatyla*, and *Bollmanella*. However, the gonopods of *Austrotyla* species appear to be simpler and more reduced, and obviously do not form a forceps-like structure. Further, pregonopodal leg modifications show significant interspecies and intraspecies differences in *Conotyla* and *Taiyutyla*, and are stabilized in *Austrotyla* (all known species having femoral lobes on legs three and four). I consider this to be a specialization, and thus the species of *Austrotyla* seem to me to be derivative. *Achimenides pectinatus* may be further specialization of the basic austrotyline stock. For the same reasons, *Bollmanella*, with stabilized pregonopodal leg modifications and more complicated gonopods, can be considered a specialized derivative of a *Taiyutyla*-like ancestor. The two western species of *Conotyla*, *C. albertaina* and *C. atrolineata*, seem in many ways to link *Conotyla* and *Taiyutyla*.

These relationships should be recognized by establishing subfamilies. Loomis and Schmitt (1971) divided the Conotylidae into two subfamilies: *Lophominae*, including only their new species *Lophomus laxus* (treated at length below), and the *Conotylinae*, including every-

thing else. Although they designated this second subfamily name as "new," the original proposal of the family level name Conotylidae by Cook in 1895, according to the rules of nomenclature, covered the establishment of a corresponding subfamily. Also, a subfamily Conotylinae had been proposed in 1913 by Verhoeff. Verhoeff also set up the subfamily names Eudigoninae and Japanosomatinae, but these names for exotic forms probably do not apply to any North American types and can be placed outside the scope of this paper, although from Verhoeff's 1913 illustrations of *Japanosoma scabrum*, it does not appear to be very much unlike *Conotyla* and *Taiyutyla*. Loomis and Schmitt (1971) also seemed unaware of my proposal (Shear, 1971) of the family name Adritylidae for the very distinct species *Adrityla humerosa*, and included *Adrityla* in their concept of Conotylinae.

Moreover, Loomis and Schmitt's system suggests that *Lophomus laxus* represents a sister-group of all other conotylids, although clearly it was not their intent to do so. I recognize the subfamily as constituted by them, but do not believe that it should be set off in such a way as to indicate a complete divergence for all other conotylids. The question of sister-groups in the Conotylidae cannot be properly dealt with until the Asian and South American genera mentioned above can be studied.

Now, with a more or less complete knowledge of the range of species to be found in the Conotylidae in North America, a more useful division into subfamilies can be carried out.

KEY TO SUBFAMILIES AND GENERA OF THE CONOTYLIIDAE

1. Posterior colpocoxites of male gonopods consisting of long, thin structure partially sheathed at base by sternal process (fig. 32); body with paranota prominent, flat, and rimmed Subfamily Macromastinae Loomis and Schmitt, Genus *Macromastus* Loomis and Schmitt. Posterior colpocoxites more complex, not as above 2
2. Posterior colpocoxites of male gonopods with an *articulated* basal flagellum (figs. 34, 37) Subfamily Lophominae Loomis and Schmitt, ge-
- nus *Lophomus* Loomis and Schmitt. Gonopods not as above. 3
3. Anterior gonopods flattened, more or less platelike, usually larger than posterior gonopod colpocoxites, with lateral sternal processes at least partially fused to lateral regions of anterior gonopods Subfamily Austrotylinae, new. 4
- Anterior gonopods not flattened, more or less complex, with a number of branches and processes, usually smaller than posterior gonopod colpocoxites; without lateral sternal process Subfamily Conotylinae Cook, 7
4. Posterior gonopod telopodites absent; ice caves in Idaho *Idagona* Buckett and Gardner
- Posterior gonopods with telopodites 5
5. Anterior gonopods basally fused; anterior gonopod sternum divided; Wisconsin, Illinois, and Iowa, mostly in caves *Achemenides* Shear. Anterior gonopods not fused; anterior gonopod sternum entire. 6
6. Anterior gonopods larger than posterior gonopod colpocoxites; Wisconsin, Illinois, Missouri, Rocky Mountains from Alberta to Chihuahua *Austrotyla* Causey. Anterior gonopods smaller than posterior gonopod colpocoxites (fig. 42); Montana *Corypus* Loomis and Schmitt.
7. Troglobitic species; ocelli reduced in number to about 10; anterior and posterior gonopods both two-branched; California *Plumatyla* Shear. Pigmented species; not troglobitic; more than 10 ocelli; anterior and posterior gonopods not both two-branched. 8
8. Posterior gonopod colpocoxites with *unarticulated* flagellum at least partially sheathed by another branch of coxite; animals 7 mm. or less in length; Oregon and Washington *Bollmanella* Chamberlin. Posterior gonopod colpocoxites without such a branch; animals usually more than 7 mm. long 9
9. Anterior gonopods subequal to posterior gonopod colpocoxites; anterior gonopod sternum heavily sclerotized; posterior gonopod colpocoxites frequently complexly branched; central California north to Washington and thence east to Montana in the region of the Continental Divide *Taiyutyla* Chamberlin. Anterior gonopods smaller than posterior gon-

opod colpocoxites, usually not complexly branched; Maine south to North Carolina, west to Indiana, Rocky Mountains of Alberta and British Columbia.
 *Conotyla* Cook and Collins.

FAMILY CONOTYLIDAE COOK

Conotylidae Cook 1896, p. 8 (type genus *Conotyla* Cook). Verhoeff, 1932, p. 500. Shear, 1971, p. 58, 1972, p. 268.

Macromastidae Loomis and Schmitt, 1971, p. 126 (type genus *Macromastus* Loomis and Schmitt). New subjective synonymy.

Synonymy. A diagnosis and description of the family is given in Shear (1971, 1972) and needs no emendation here to include *Macromastus marginandus* Loomis and Schmitt, the type species of the type genus of the family Macromastidae. Loomis and Schmitt (1971) named this family because *M. marginandus* seemed to them to be "unusually large," bore prominent, flat paranota, and had an extra segment in the posterior gonopod telopodites. The somatic modifications alone do not justify separating this species at the family level; the development of the paranota is very nearly equal in *Lophomus laxus*, another species they described in the same paper. The extra segment in the posterior gonopods appears to be a mistaken observation: I could not discern the joint clearly depicted by Loomis and Schmitt in their illustration (1971, p. 127, fig. 29; compare my fig. 33).

SUBFAMILY CONOTYLINAE COOK

Conotylinae, Loomis and Schmitt, 1971, p. 121, in part (including only *Conotyla* and *Taiyutyla*, of the genera mentioned; type genus, *Conotyla* Cook and Collins).

Diagnosis. Conotylid millipedes with 30 segments and undivided mentum. Anterior gonopods simple, acuminate, or with two branches, erect or clasping posterior gonopod colpocoxites. Posterior gonopod colpocoxites simple or complexly branched, upright; posterior gonopod telopodites present, two-segmented.

Included genera. *Conotyla*, *Taiyutyla*, *Bollmanella*, *Plumatyla*.

Discussion. This subfamily at first appears heterogeneous, but all the genera are clearly

related by species with intermediate gonopod types. *Conotyla* species appear most divergent from the basic type, as I suggested earlier (Shear 1972), through the reduction of the anterior gonopods. However, *Conotyla bollmani* is strikingly like a simplified *Taiyutyla* species, except that the anterior gonopods firmly clasp the posterior. *Taiyutyla*, *Bollmanella*, and *Plumatyla* are difficult to keep separate. The picture is confused by the troglobitic adaptations shown in *Plumatyla* species, and the development in them of two branches of the anterior gonopods. The anterior gonopod sterna in *P. humerosa* actually resemble those of *Austrotyla* species! Species of *Bollmanella* are generally smaller than those of *Taiyutyla*, and bear an unarticulated, sheathed flagelliform branch on the posterior gonopod. They also have stabilized pre-gonopodal leg modifications, but otherwise there seems to be a fair amount of continuity in gonopod pattern.

CONOTYLA COOK AND COLLINS

Conotyla Cook and Collins, 1895, p. 70 (type species by original designation *C. fischeri* Cook and Collins): Shear, 1971, p. 64, 1972, p. 271.

Proconotyla Verhoeff, 1932, p. 501 (type species by original designation and monotypy *P. blakei* Verhoeff).

Brunsonia Loomis and Schmitt, 1971, p. 122 [type species *B. complexipes* Loomis and Schmitt (=*Conotyla albertana* Chamberlin) by original designation]. New subjective synonymy.

Synonymy. The genus is diagnosed, described, and discussed in detail in my earlier papers (Shear, 1971, 1972). Having gonopods identical to an earlier described species, *Brunsonia complexipes* is a synonym of *Conotyla albertana* Chamberlin; the records given by Loomis and Schmitt (1971) extend the range of this common species south into Montana. I have hundreds of specimens from the Maligne Range, Alberta, and the species seems to be found quite frequently in treeless areas as well as forests, at high elevations.

Species of *Conotyla* in the northeastern United States are scattered, and most are known only from a few specimens. My 1971 key relied heavily on pregonopodal leg modification, but as

more new material accumulates, variation is apparent. However, it will be some years before enough new specimens are collected to fully assess the extent of the variation.

TAIYUTYLA CHAMBERLIN

Taiyutyla Chamberlin 1952, p. 1 (type species *T. corvallis* Chamberlin by original designation). Shear, 1971, p. 86, 1972, p. 272.

The genus is adequately diagnosed and described in my 1971 revision, which, however, included only three species. The discovery of additional species included some that lack apophyses on the third and fourth legs of the males, and which bear a coxal depression, or pocket, posteriorly on the posterior gonopods.

Species of *Taiyutyla* are distributed through the Coast Ranges of the Pacific Northwest from San Francisco Bay to the Columbia River, with one species (previously misplaced in *Conotyla*) known from interior California and one from Western Montana. The lack of records north of the Columbia River is almost certainly due only to the lack of collections from Washington state. Because of the numerous species probably remaining to be discovered, I present no key at this time. All the species can quickly be distinguished from one another by comparison of the illustrations given here, and in my earlier paper (Shear, 1971).

Taiyutyla extorris (Shear) new combination

Conotyla extorris Shear, 1971, p. 70-71, figs. 22, 23.

I described this species in *Conotyla* in 1971 because it seemed to me to combine features of *Conotyla* and *Taiyutyla*, but appeared to fit best in *Conotyla*. A better knowledge of the range of species belonging to *Taiyutyla* has made me change my mind; this generic assignment of *extorris* is also more palatable zoogeographically, although the species still is out of the range of the genus to some degree, and is unusual in having unmodified pregonopodal legs. Only the male holotype is known, from one mile south of Grass Valley, Nevada Co., California; it is in the Museum of Comparative Zoology.

Taiyutyla corvallis Chamberlin

Taiyutyla corvallis Chamberlin 1952, p. 1, figs. 1, 2. Shear, 1971, p. 87, figs. 8, 59, 60.

This, the type species of the genus, is known only from Corvallis, Oregon. Despite extensive sampling in that region by E. M. Benedict, no additional material has turned up, and I can add nothing to my 1971 account.

Taiyutyla napa Shear

Taiyutyla napa Shear 1971, p. 87-88, figs. 63, 64.

This species is known only from Mt. St. Helena, Napa Co., California. I have nothing to add to my 1971 description.

Taiyutyla francisca Shear

Taiyutyla francisca Shear, 1971, p. 88, figs. 61, 62.

This species is known from Inverness, Marin Co., California. Nothing additional concerning it has come to my attention.

Taiyutyla clatsop, new species Figures 1, 2

Types. Male holotype and female paratype from 700 ft. elev., 5 mi. N and 7 mi. W of Elsie (T5N/R9W), Clatsop Co., Oregon, collected March 15, 1972, by E. M. Benedict, deposited in AMNH.

Etymology. The species epithet is a noun in apposition referring to the type locality.

Diagnosis. None of the other species have the pregonopodal legs without femoral knobs, except for leg 7. The posterior gonopod colpocoxites somewhat resemble those of *T. prefemorata* and related species (*T. lewisi*, *T. clarki*, etc.) but are narrower (fig. 1) and bear a pair of flagelliform branches basally.

Male. 6.0 mm. long; antennal segment three 0.41 mm. long. Eighteen pigmented ocelli in three rows form triangular eyepatch. Pigmentation very light tan, mottled slightly darker. Segments of typical conotylid form. Legpairs three to seven much enlarged, pairs three and four the largest, size decreasing five through seven, but pair seven still larger than postgonopodal legs.

Small blunt knobs basal on femora of legs seven; pregonopodal femora otherwise unmodified. Anterior gonopods (fig. 2) slightly curved posteriad, passing lateral to midpoint of posterior gonopod colpocoxites, with lateral T-shaped branch and complex termination including microsetae as shown. Posterior gonopods with telopodite articles short and subequal, colpocoxites strongly curved posteriad, with two flagelliform basal branches, small terminal fimbriate area, divided tip (fig. 1).

Distribution. Known only from type locality.

Notes: The types were collected from duff and loose bark around the base of a sitka spruce. The relationships of this species are somewhat obscure, but it serves at least superficially to link species of *Bollmanella* and *Taiyutyla*, due to the small size and the unsheathed flagelliform branches of the posterior gonopod. However, the species lacks the typical pregonopodal leg modifications of *Bollmanella* species. Within *Taiyutyla*, *T. clatsop* is distant from most of the other species, but may be related to *T. trifurca*, considering the peculiar posterior gonopods of that species.

Taiyutyla benedictae, new species Figures 3-5

Types. Male holotype, male and female paratypes 4100 ft. elev., 17 mi. NE of McKenzie Bridge on Highway 242, Lane Co., Oregon, collected October 16, 1971, by E. M. Benedict, deposited in AMNH.

Etymology. The species epithet honors the collector, E. M. Benedict.

Diagnosis. The peculiar posterior gonopods (fig. 4) and the form of the posterior gonopod sternum (fig. 3) set this species apart from all others.

Male. 9.3 mm. long; third antennal segment 0.53 mm. long. Twenty pigmented ocelli in three or four rows form triangular eyepatches. Pigmentation light tan, mottled darker, shaded darker on head and antennae. Legpairs one and two reduced in size, pairs three and five enlarged, pair six nearly normal, pair seven of normal size. Legpairs three and four with large, capitate, basal femoral knobs. Anterior gonopods (fig. 5) very simple, acuminate, curved posteriad, with

definite basal pit and gland channel. Posterior gonopods with telopodite articles large, distal article largest; colpocoxites (fig. 4) with broad, posterior membranous area, short lateral branch, and double termination with lateral prong very long and coiled, mesal prong sharply hooked.

Female. Length, 9.9 mm. Third antennal segment 0.45 mm. long. Body stouter than in male, pigmentation slightly darker. No sexual characters of taxonomic value.

Distribution. Known only from type locality.

Notes: The types were taken from conifer duff and rotted wood. Like *T. clatsop*, this species might have been placed in *Bollmanella*, but is larger than any species of that genus and lacks the sheathed flagelliform branch of the posterior gonopods.

Taiyutyla simplex, new species Figures 6-8

Types. Male holotype and male and female paratypes 400 ft. elev., 3.2 mi. NE of Scottsburg (T22S/R9W/Sec. 5), Douglas Co., Oregon, collected December 11, 1971, by E. M. Benedict, deposited in AMNH.

Etymology. The species epithet is an adjective referring to the form of the gonopods.

Diagnosis. The simple gonopods relate this species to *corvallis*, from which it may be distinguished by the form of the posterior gonopod colpocoxites, which in *simplex* are not apically bifurcate.

Male. Length, 11.6 mm.; third antennal article 0.55 mm. long. Twenty-two ocelli in four rows in triangular eyepatch. Pigmentation light brown, heavily mottled darker purplish brown on all segments and head; antennae dark brown. Legpairs one and two reduced in size; pairs three and four somewhat enlarged, pairs five, six, and seven of nearly normal size. Legpairs three and four with moderately developed mesal knobs on femora. Anterior gonopods (fig. 6) broad, flat, simple, bladelike, but with a complex arrangement of specialized flattened setae and microsetae on apical branch (fig. 8). Posterior gonopods (fig. 7) with distal telopodite article about twice as long as basal; colpocoxite simple, curved slightly posteriad.

Female. Length, 11.9 mm., third antennal

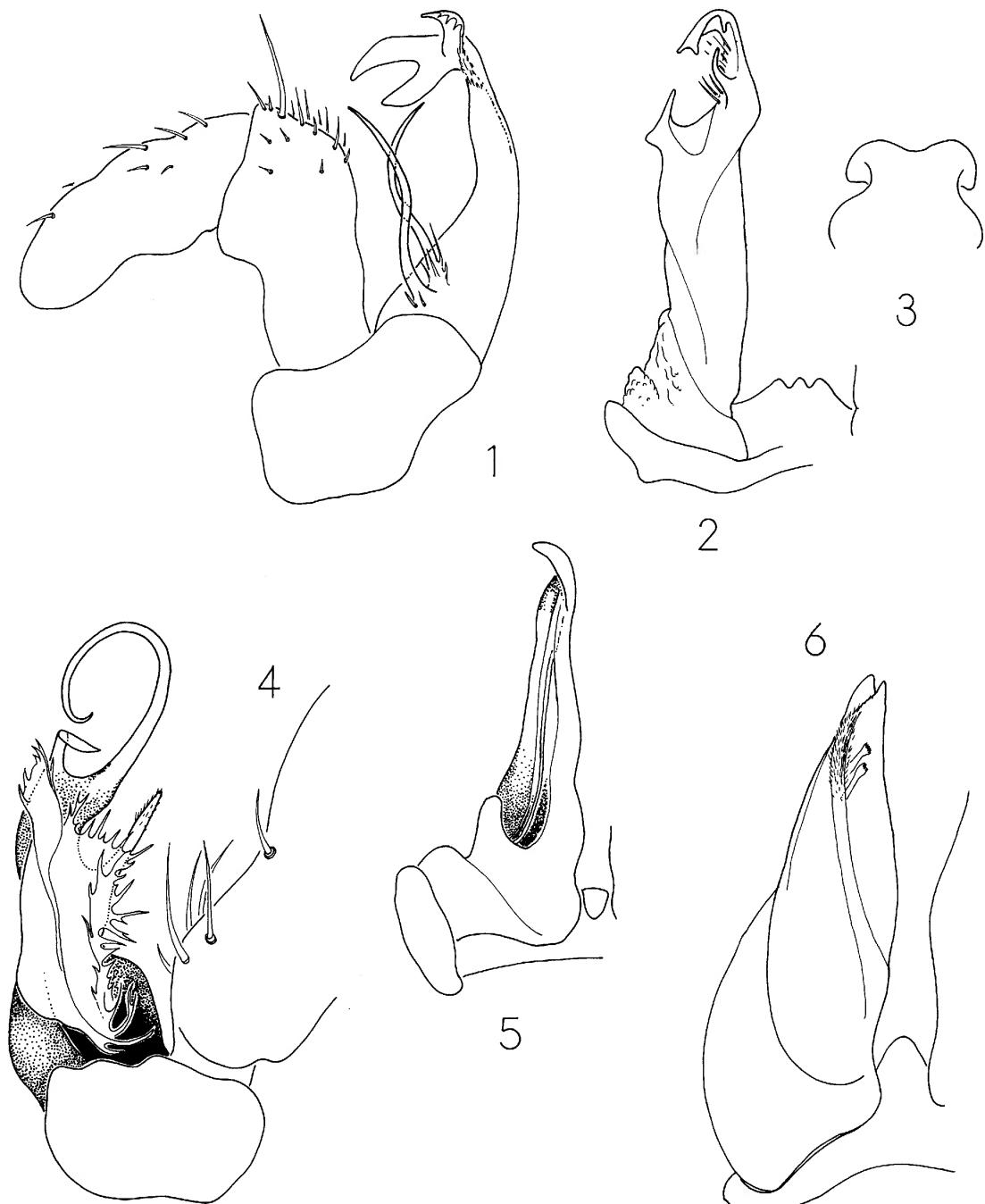


FIG. 1-6. *Taiyutyla* sp. 1, 2. *T. clatsop*. 1. Right posterior gonopod, posterior view. 2. Right anterior gonopod, posterior view. 3-5. *T. benedictae*. 3. Median process from posterior gonopod sternum, anterior view. 4. Left posterior gonopod colpocoxite, posterior view. 5. Right anterior gonopod, posterior view. 6. *T. simplex*, right anterior gonopod, posterior view.

segment 0.52 mm. long. Color and general appearance as in male, but body somewhat stouter.

Distribution. (All collections by E. M. Benedict) OREGON: *Coos Co.* Hillside above Myrtle Grove campground, T32S/R11W/Sec. 18, elev. 500 ft., Feb. 19, 1972, 2♂ (PWAS); 14 mi. E, 2 mi. S of Allegany, Weyerhaeuser Millicoma Tree Farm, Company Rd. 600, T25S/R9W/Sec. 16, elev. 650 ft., Nov. 21, 1971, ♂ (PWAS). *Curry Co.* 7 mi. N, 3 mi. W of Brookings, T40S/R14W/Sec. 4, sea level, Feb. 2, 1972, ♂ (PWAS). *Douglas Co.* Elliott State Forest, 1 mi. S, 2 mi. W of Ash, T23S/R10W/Sec. 27, elev. 1100 ft., Dec. 11, 1971, ♂ (PWAS).

Notes: This species is most commonly associated with duff and litter from deciduous trees, such as bigleaf maple. At the Millicoma Tree Farm, it was collected in the riparian zone of Fall Creek; at that point and at Elliott State Forest, *T. simplex* is syntopic with *T. millicoma*. The latter is much more common at both sites. *Bolmanella oregona* Chamberlin was also collected there.

Taiyutyla trifurca, new species

Figures 9-11

Types. Male holotype and male paratype from 1800 ft. elev., 2 mi. N and 7 mi. E of the McKenzie Bridge on Highway 126 (T16S/R6E), Douglas Co., Oregon, collected February 28, 1972, by E. M. Benedict, deposited in AMNH.

Etymology. The species epithet is an adjective referring to the three-branched condition of the posterior gonopod colpocoxites.

Diagnosis. No other species of *Taiyutyla* has the gonopod colpocoxites three-branched as in figure 10.

Male. 9.5 mm. Antennal segment three 0.49 mm. long. Ocelli 20 in four rows form triangular eyepatch. Pigmentation off-white, lightly marked pale tan. Legpairs one and two reduced in size, pairs three to seven enlarged, pair three only slightly the largest; pairs five and six with small basal femoral knobs, pair seven with large distal femoral hook (fig. 9). Anterior gonopods (fig. 11) relatively simple, platelike, slightly curved posteriad, bearing mesial hooklike branch. Posterior gonopods (fig. 10) with telopodite articles

relatively small and subequal; colpocoxites three-branched, lateral branch broad, apically laciniate, with lateral group of microsetae, middle branch flagelliform, mesial branch apically broadened, spatulate.

Female. Unknown.

Distribution. (All collections by E. M. Benedict) OREGON. *Lane Co.*, Paradise Park on US 126, T16S/R6E, 1700 ft., elev., Feb. 24, 1972, ♂ (PWAS). *Clackamas Co.* Hugh Creek, 44 mi. SE Estacada on Forest Service Rd. S-70, elev. 2500 ft., Oct. 9, 1971, ♂ (PWAS).

Notes: The types came from a Berlese sample of conifer and vine maple duff; at Paradise Park a male was taken from moss and hemlock duff. The Paradise Park male has small basal femoral knobs on legpairs three and four as well as on five and six, but those on the latter two pairs are larger. The male from Clackamas County resembles the types, but has the lobe of legpair seven smaller and definitely fungiform.

Taiyutyla curvata Loomis and Schmitt

Figures 12, 13

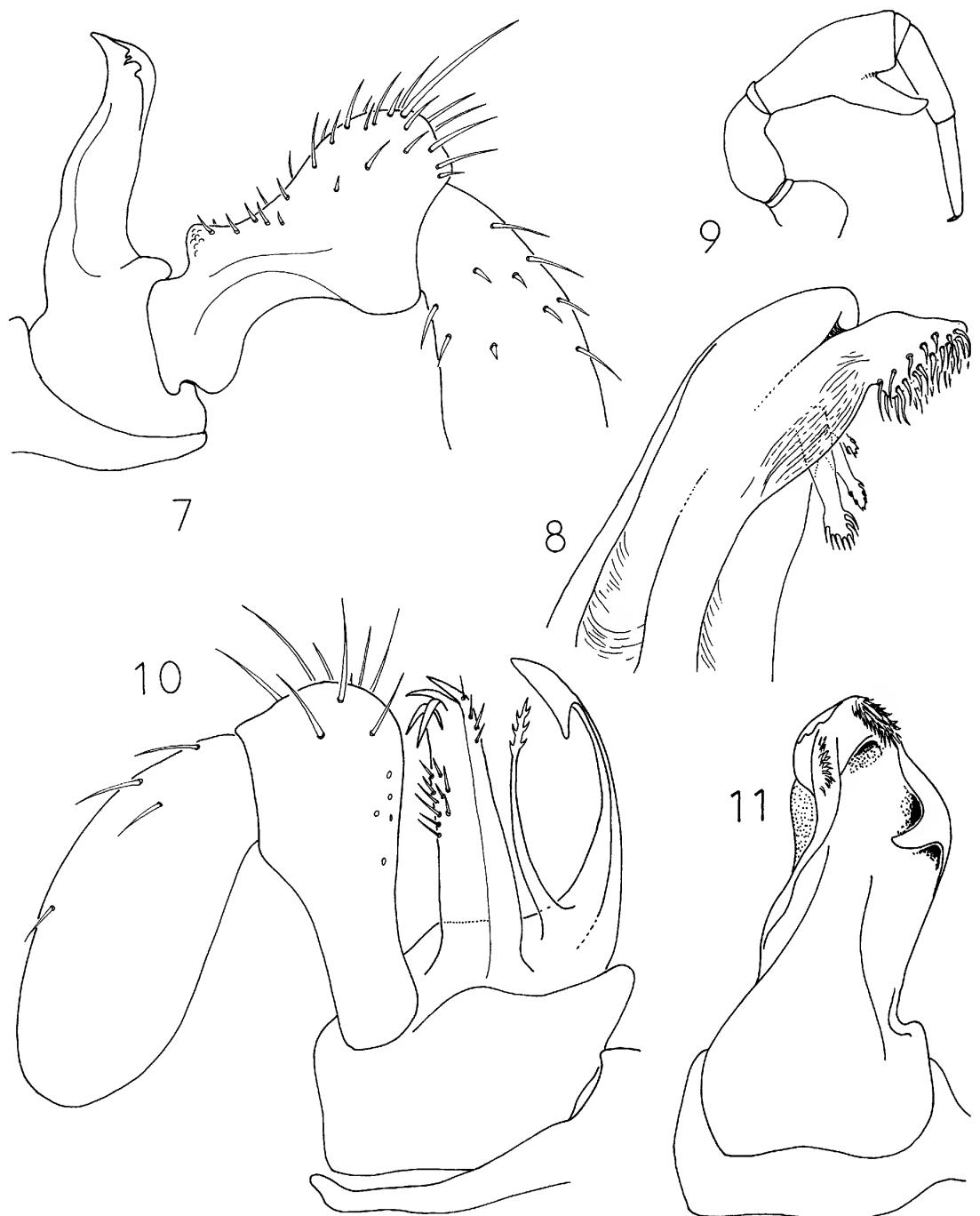
Taiyutyla curvata Loomis and Schmitt, 1971, p. 125, figs. 19-21 (male holotype from Leigh Lake Campground, Lincoln Co., Montana, 3600 ft. elev., collected June 14, 1949, no collector given, deposited in USNM, examined).

Diagnosis. The only *Taiyutyla* known from Montana. Clearly related to *T. trifurca* (see above) but differing in the form of the posterior gonopod colpocoxites (fig. 12).

Male. Length 9.8 mm.; antennal segment three 0.47 mm. long. Ocelli 22 in four rows forming triangular eyepatch. Pigmentation faded from long preservation, pale. Legpairs one and two reduced; pairs three to seven enlarged, decreasing in size posteriorly, pair seven still larger than postgonopodal legs. Legpair five with large mesial femoral knobs, smaller knobs on pair four. Anterior gonopods (fig. 13) acuminate, curved, with small triangular lateral branch. Posterior gonopod colpocoxites (fig. 12) with three branches as shown.

Female. Unknown.

Distribution. Known only from the type locality.



FIGS. 7-11. *Taiyutyla* sp. 7, 8. *T. simplex*. 7. Left posterior gonopod colpocoxite, posterior view. 8. Apex of right anterior gonopod, lateral view. 9-11. *T. trifurca*. 9. Right leg seven of male, posterior view. 10. Right posterior gonopod, posterior view. 11. Right anterior gonopod, posterior view.

Notes: This species is outside the known range of other *Taiyutyla* species, and suggests that an exploration of eastern Washington and northern Idaho might turn up more species.

***Taiyutyla prefemorata*, new species**
Figures 14, 15

Types. Male holotype and male and female paratypes 1000 ft. elev., Canyonville Co. Park, 2 mi. E of Canyonville on Highway 227 (T30S/R5E), Douglas Co., Oregon, collected November 6, 1971, by E. M. Benedict, deposited in AMNH.

Etymology. The species epithet is an adjective referring to the knobs on the prefemora of the male pregonopodal legs.

Diagnosis. The knobs of the prefemora of the pregonopodal legs clearly relate this species and the following, *T. millicoma*. The present species has such knobs on legpairs five and six; they are reduced to low swellings on these legs in *T. millicoma*.

Male. Length, 10.8 mm. Antennal segment three 0.54 mm. long. Nineteen ocelli in three rows plus single ventral ocellus form triangular eyepatch. Pigmentation medium brown marked dark purplish brown. Legpairs one and two much reduced; pairs three to seven enlarged and subequal. Legpairs three to seven with large basal femoral knobs, largest on pairs three and four; prefemoral distal knobs on pairs five to seven increasing in size posteriad. Anterior gonopod tip (fig. 15) with apical spine above posterior fimbriate area; lateral margin roughened. Posterior gonopod colpocoxite (fig. 14) apically bifurcate, turned mesial, with posterior branch bearing microsetae.

Female. Length 11.1 mm. Antennal segment three 0.51 mm. long. Pigmentation as in male. No sexual characters of taxonomic value.

Distribution. (All collections by E. M. Benedict) OREGON. Douglas Co. 0.5 mi. E of Tiller, above Elk Creek on Hwy. 227, T30S/R2W/Sec. 34, 1100 ft. elev., Nov. 6, 1971, 2♂, ♀ (PWAS); Mack Brown Park on Umpqua River, T25S/R7W, 400 ft. elev., Feb. 7, 1972, 2♂ (PWAS); 1 mi. SE of Tiller on Hwy. 227, Umpqua River Valley, T30S/R2W/Sec. 34, 100 ft. elev., Nov. 6, 1971,

2♀ (PWAS). Lane Co. Rd. 1602 to White Branch Youth Camp, 9 mi. E of McKenzie Bridge, 2400 ft. elev., Oct. 16, 1971, ♂ (PWAS); Perkins Peninsula State Park, Fern Ridge Reservoir, T17S/R5W/Sec. 28, 400 ft. elev., Dec. 4, 1971, ♂ (PWAS).

Notes: This species seems to be definitely associated with duff and litter from deciduous trees, having been collected from alder, black cottonwood, live oak, and maple litter and duff at various localities. Together with *T. millicoma*, *variata*, *lewisi*, and *clarki*, this species forms a group of related species marked by an apical spine on the anterior gonopod colpocoxite (except in *clarki*) usually bent laterad at a right angle, and a fimbriate or setose posterior branch. All are from the Douglas and Lane county areas.

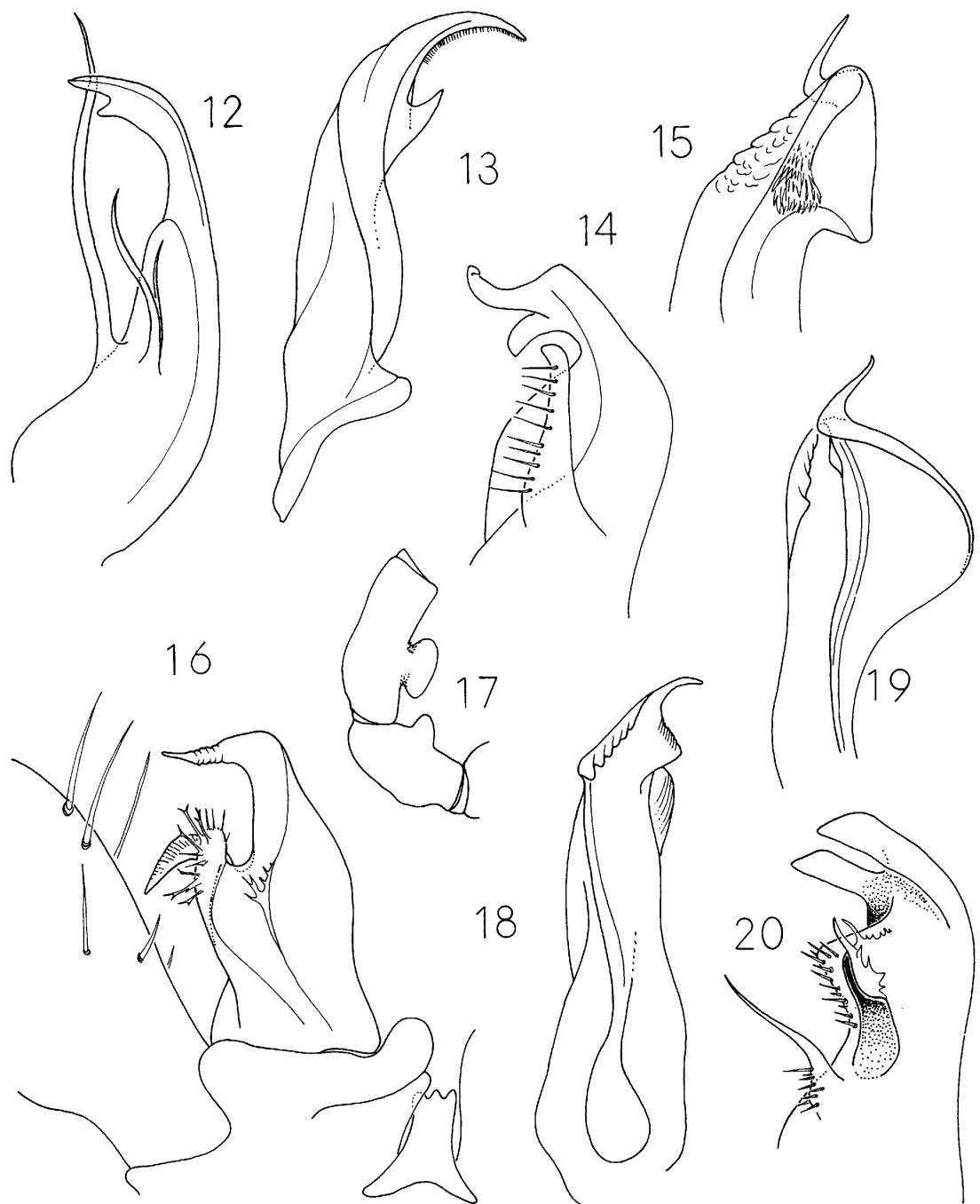
***Taiyutyla millicoma*, new species**
Figures 16-18

Types. Male holotype, male and female paratypes 1200 ft., elev., 14 mi. E and 2 mi. S of Allegany on Weyerhauser Millicoma Tree Farm Company Rd. 6000 (T25S/R9W/Sec. 16), Coos Co., Oregon, collected Nov. 21, 1971, by E. M. Benedict, deposited in AMNH.

Etymology. The species epithet is a noun in apposition referring to the type locality.

Diagnosis. Clearly related to *prefemorata*, but lacking the large prefemoral knobs, which appear in this species as low swellings. The femoral knobs found on legpairs five and six of *prefemorata* are absent in most *millicoma* males (see Notes below).

Male. Length, 10.8 mm.; antennal segment three 0.60 mm. long; ocelli 22 in four rows forming triangular eyepatch. Pigmentation light tan, mottled darker purplish brown. First two legpairs reduced in size; pairs three through seven uniformly larger. Small prefemoral knobs on leg pairs three to seven, smallest on legpairs five and six; large capitate or fungiform knobs (fig. 17) on femora of legpairs three, four, and seven. Anterior gonopods (fig. 18) typical of this group, flattened, acuminate, slightly curved posteriad, with basal depression and gland channel, bearing apical spine. Posterior gonopod colpocoxites (fig. 16) likewise typical, but apical branches widely



FIGS. 12-20. *Taiyutyla* sp. 12, 13. *T. curvata*. 12. Right posterior gonopod colpocoxite, posterior view. 13. Right anterior gonopod, lateral view. 14, 15. *T. prefemorata*. 14. Apex of right posterior gonopod colpocoxite, posterior view. 15. Apex of right anterior gonopod, posterior view. 16-18. *T. millicoma*. 16. Right posterior gonopod colpocoxite, posterior view. 17. Prefemur and femur of right leg seven of male, posterior view. 18. Right anterior gonopod, lateral view. 19, 20. *T. variata*, male from Buckley County Park. 19. Apex of right anterior gonopod, posterior view. 20. Apex of right posterior gonopod colpocoxites, posterior view.

separated and sharply curved, posterior branch lobelike, with ornaments of fine cuticle, not microsetae. Posterior gonopod sternum with three teeth between gonopods.

Female. Length, 10.5 mm. Antennal segment three 0.53 mm. long. Pigmentation as in male.

Distribution. (All collections by E. M. Benedict) OREGON. Coos Co. 6 mi. E, 2 mi. S of Allegany, Millicoma Tree Farm, T24S/R9W/Sec. 14, Nov. 20, 1971, 2♂ 2♀ (PWAS). Douglas Co. 11 mi. E, 4 mi. S of Allegany at Douglas-Coos Co. line, Millicoma Tree Farm, T24S/R9W/Sec. 18, Nov. 20, 1971, 2♂ 2♀ (PWAS). Same locality as preceding, but in Sec. 31, Nov. 21, 1971, 2♂ 2♀ (PWAS). Elliott State Forest, 1 mi. S, 2 mi. W of Ash, T29S/R10W/Sec. 27, 500 ft. elev., Dec. 11, 1971, 2♂ 2♀ (PWAS). Same as preceding, but 1100 ft. elev., 2♂ 2♀ (PWAS).

Notes: This species has been taken in Berlese samples of hemlock duff, moss, duff from *Rhododendron*, myrtle, bigleaf maple, red alder, and black cottonwood, and from rotted wood. At the type locality and at Elliott State Forest, *T. millicoma* is syntopic with *T. simplex*, both species being taken from the same Berlese samples. Although there is little variation in the form of the gonopods, all samples come from a limited geographical area. One male from the Millicoma Tree farm, 11 mi. E and 4 mi. S of Allegany, had definite knobs on femora five, but this is probably an anomaly since other males in the same collection did not have them.

Taiyutyla variata, new species

Figures 19-22

Types. Male holotype and male paratypes 1660 ft. elev., Buckley Co. Park Rest Area, 3.5 mi. S of Ruch on the Upper Applegate River, 2.5 mi. from Highway 238 (T38S/R3W/Sec. 15), Jackson Co., Oregon, collected November 13, 1971, by E. M. Benedict, deposited in AMNH.

Etymology. The species epithet is an adjective referring to the variability of this species.

Diagnosis. Related to *millicoma*, *prefemorata*, *clarki*, and *lewisi* and may be distinguished from all those species by the broadly flared apex of the anterior gonopods (figs. 19, 22).

Male. 12.1 mm. long; antennal segment three 0.68 mm. long. Twenty ocelli in four rows form triangular eyepatch. Pigmentation medium tan, marked darker purplish brown, some specimens

darker. Legpairs one and two reduced in size; pairs three to seven enlarged, pairs three to five much the largest, pairs six and seven more slender. Mesial femoral knobs on legpairs three to six, increasing in size posteriad; no knobs on femora of legpair seven. Anterior gonopods (fig. 19) with apex broadly flared mesiad, short curved terminal spine. Posterior gonopod colpo-coxites (fig. 20) typical of group, apex deeply divided and curved laterad, posterior branch relatively short and slender, with basal group of microsetae.

Females. Unknown.

Distribution. (All collections by E. M. Benedict) OREGON: Josephine Co. 1 mi. S, 0.5 mi. W of O'Brien, T40S/R9W/Sec. 25, 1400 ft., elev., Dec. 18, 1971, 2♂ (PWAS). 0.3 mi. S, 2.5 mi. E of O'Brien, T40S/R8W/Sec. 28, 1400 ft. elev., Dec. 18, 1971. 2♂ (PWAS).

Notes: At the type locality this species was taken from a Berlese sample of white alder and willow litter. The O'Brien specimens show some clear differences from the types in the posterior gonopods (fig. 21) and in the pregonopodal leg modifications, in which femoral knobs appear on legpairs six and seven, being large and hooklike on the latter. Legpairs three, four, and five lack femoral knobs.

Taiyutyla lewisi, new species

Figures 23-25

Types. Male holotype and male and female paratypes 400 ft. elev., 5 mi. N of Elmira at the junction of Demming and Territorial roads (T17S/R5W/Sec. 5), Lane Co., Oregon, collected Dec. 4, 1971, by E. M. Benedict, deposited in AMNH.

Etymology. The species epithet honors Capt. Meriwether Lewis, noted explorer of the Pacific Northwest in the early nineteenth-century.

Diagnosis. Similar to and related to the preceding three species and *T. clarki*, but distinct in the longer apical spine of the anterior gonopods (figs. 24, 25).

Male. Length, 11.5 mm. Antennal segment three 0.62 mm. long. Ocelli 24 in four rows, plus single ocellus. Pigmentation medium brown, marked darker brown especially on anterior segments; the darkest pigmented *Taiyutyla* species. Legpairs one and two reduced; legpairs three to seven enlarged. Legpairs four to six with

moderate femoral knobs mesial, knobs very strong on femora of legpair seven. Anterior gonopods (fig. 25) strongly curved posteriad, with long apical spine (fig. 24). Posterior gonopod colpocoxites typical of group (fig. 23), very similar to those of *T. variata* from Buckley Park.

Female. 11.0 mm. long, antennal segment three 0.57 mm. long. Pigmentation as in male.

Distribution. (All collections by E. M. Benedict except as noted) OREGON: Lane Co. Ellmaker Drive 0.3 mi. N Hwy. 26, 11 mi. W of Eugene, T17S/R5W, 400 ft. elev., Dec. 4, 1971, 2♂ (PWAS); 6 mi. W of Eugene, 0.3 mi. N of Hwy. 26 on Walker Road, T17S/R5W/Sec. 26, 500 ft. elev., Dec. 4, 1971, ♂♀ (PWAS). Benton Co. Rt. 34 at Benton Co. line, Oct. 30, 1960, D. R. Malcolm, 2♂♀ (PWAS); small canyon 2.3 mi. NW of Glenbrook on S. Fork Alsea River Acess Road, T14S/R6W/Sec. 29, 1200 ft. elev., Dec. 4, 1971, 2♂ 2♀ (PWAS). Columbia Co. 3 mi. SW of Clatskanie, T7N/R4W/Sec. 7, elev., 300 ft. Jan. 8, 1972. 2♂ (PWAS). WASHINGTON. Mason Co. 1 mi. W of Bayshore, 4 mi. N of Shelton, Nov. 25, 1967, ♂ (PWAS).

Notes: This species has been collected from Berlese samples of pine and oak duff, moss, red alder litter, fungal mycelia, rotted wood, and rotted ponderosa pine bark chips. Consistent with its widespread distribution, there is some variation in the pregonopodal leg modifications. A male from the Benton Co. line has a heavy basal knob on femora seven and very low distal swellings on femora three to six. Males from Clatskanie have a smaller knob on seven but large mesial knobs on five and six; femora three and four are unmodified, and the legs themselves are of nearly normal size. Specimens from Mason Co., Washington, resemble the Clatskanie males closely. The Glenbrook males are like the Benton Co. ones, but the knob of femur seven is truly enormous, whereas knobs are absent from femora three to six.

Taiyutyla clarki, new species
Figures 26-28

Types. Male holotype from 1700 ft. elev., Boulder Flat Campground, 3 mi. E, 10 miles S of Steamboat (T26S/R2E/Sec. 13), Douglas Co.,

Oregon, collected October 30, 1971, by E. M. Benedict, deposited in AMNH.

Etymology. The species epithet honors Capt. William Clark, who, with Meriwether Lewis, led the first American expedition to the mouth of the Columbia River overland from St. Louis, Missouri.

Diagnosis. Distinct from the preceding four species in the undivided tip of the posterior gonopod colpocoxites.

Male. Length, 9.2 mm. Antennal segment three 0.50 mm. long. Ocelli 19 in three rows, forming triangular eyepatch. Pigmentation pale tan, anterior segments marked slightly darker. Legpairs one and two reduced in size, pairs three to seven enlarged but decreasing in size posteriad, with pair three the largest. Large, mesial hooked knobs on femora three and four; knobs weaker and basal on femora five and six; femora of legpair seven unmodified. Anterior gonopods (figs. 27, 28) with apical spine somewhat broadened, gonopod termination complex. Posterior gonopod colpocoxites (fig. 26) with apex turned laterad at 90 degree angle, but not divided: posterior branch rotated mesiad, divided.

Female. Unknown.

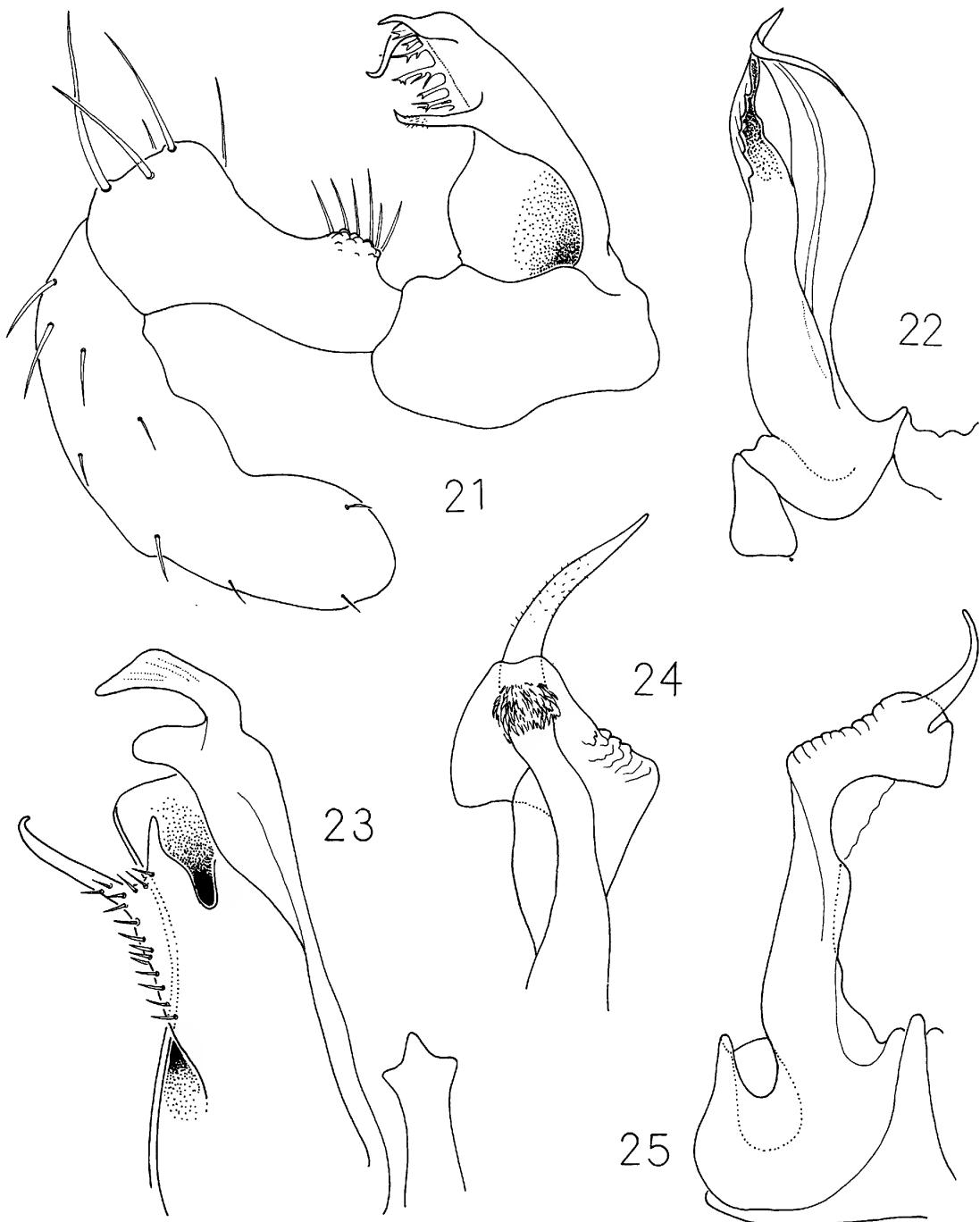
Distribution. (All collections by E. M. Benedict) OREGON: Douglas Co. Cleveland Hill, beside cemetery, T26S/R7W, 500 ft. elev., Feb. 7, 1972, ♂ (PWAS). Lane Co. 13 mi. E of McKenzie Bridge on McKenzie Pass Hwy. 242, 3200 ft. elev., Oct. 16, 1971, 2♂ (PWAS).

Notes: This species has been taken from Berlese samples of moss and of red alder and vine maple duff. Although *T. clarki* is clearly related to the preceding four species, it differs from them in size, and in the undivided apex of the posterior gonopod colpocoxite.

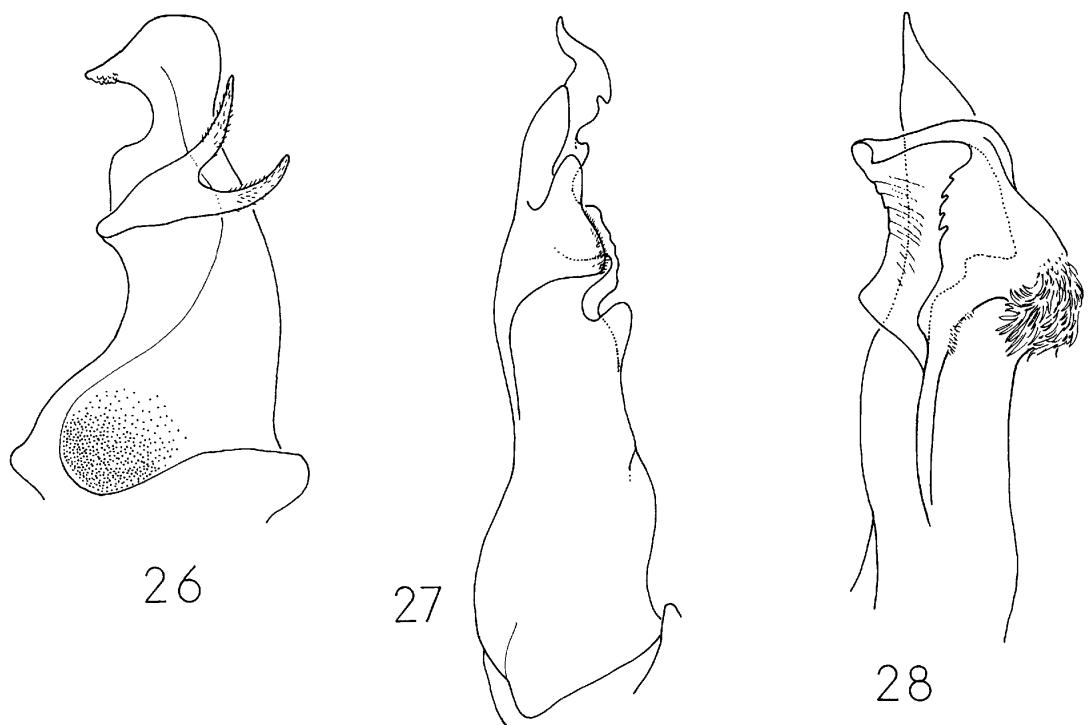
SUBFAMILY MACROMASTINAE
LOOMIS AND SCHMITT, new status

Macromastidae Loomis and Schmitt, 1971, p. 126 (type genus *Macromastus* Loomis and Schmitt, 1971).

Diagnosis. Thirty-segmented conotylids with undivided mentum. Anterior gonopods with two subequal branches (fig. 29), deeply grooved on anterior face; anterior gonopod sternum extend-



FIGS. 21-25. *Taiyutyla* sp. 21, 22. *T. variata*, male from near O'Brien. 21. Right posterior gonopod, posterior view. 22. Right anterior gonopod, posterior view. 23-25. *T. lewisi*. 23. Right posterior gonopod colpocoxite, posterior view. 24. Apex of right anterior gonopod, posterior view. 25. Right anterior gonopod, lateral view.



FIGS. 26-28. *Taiyutyla clarki*. 26. Right posterior gonopod colpocoxite, posterior view. 27. Right anterior gonopod, lateral view. 28. Apex of right anterior gonopod, posterior view.

ing partway up anterolateral surface of gonopods. Posterior gonopods with sternum narrow, bandlike, bearing broad processes laterally (figs. 32, 33); coxa with long, spiniform colpocoxite, distally cylindrical and setose; telopodite segments as usual for family.

Included genus. Macromastus.

Macromastus marginandus Loomis and Schmitt
Figures 29-32

Macromastus marginandus Loomis and Schmitt, 1971, p. 126, figs. 26-29. (Male holotype from Idaho Co., Idaho, 17 mi. E of Lowell, deposited in USNM, examined.)

The nonsexual characters of this species are fully described by Loomis and Schmitt (1971), who thought the species distinctive enough to warrant the designation of its own family. However, such a designation is unjustified, in my opinion. The body form is not very divergent

from other conotylids, and the general gonopod plan is well within the conotylid range. The anterior gonopods (fig. 29) consist of a single piece, although a posterior view shows some indication of a separate coxal region found in a few other conotylids. The anterior gonopod sternum is not triangular, as stated by Loomis and Schmitt (1971), but is mesially bandlike and laterally extends up the sides of the gonopods (fig. 29, dotted line) as in *Austrotyla*. The colpocoxites of the posterior gonopods are simple and rodlike or spinelike (fig. 32), and are basally sheathed by a process from the sternum (fig. 31). I could not detect the division in the coxal segment as shown by Loomis and Schmitt (1971), although the gonopod was slightly twisted at that point. I examined the gonopod temporarily mounted on a microscope slide in glycerine; perhaps the illustration provided by Loomis and Schmitt was made at low magnification. The holotype had just molted (data from holotype label) and thus

various parts of the body might have been liable to distortion upon preservation.

Because the posterior gonopod colpocoxites are the simplest of all known conotylids, and the coxa is apically cylindrical and setose, *Macro-mastus marginandus* seems to suggest a primitive type. Another character that may also be primitive (that is, more like *Heterochordeuma* species) is the lack of pregonopodal leg modifications of any great nature. Legpairs three to seven are enlarged. Loomis and Schmitt detected no femoral modifications, but I found small, perforate, fungiform knobs on femora five and six (fig. 30).

SUBFAMILY LOPHOMINAE LOOMIS AND SCHMITT

Lophominae Loomis and Schmitt, 1971, p. 125 (type genus *Lophomus* Loomis and Schmitt).

Diagnosis. Thirty-segmented conotylids with undivided mentum. Anterior gonopods with two unequal branches, the inner, anterior branch the smaller; right and left gonopods sometimes fused at base; anterior gonopod sternum extending laterad and ventrad along lateral sides of gonopods. Posterior gonopods with large, posteriorly curved, simple colpocoxite, bearing at base an anteriomesal articulated flagellum (figs. 23, 39).

Included Genus. Lophomus.

LOPHOMUS LOOMIS AND SCHMITT

Lophomus Loomis and Schmitt 1971, p. 125 (type species by original designation *Lophomus laxus* Loomis and Schmitt).

Troglotyla Causey 1972, p. 27 (type species *Troglotyla skamania* Causey, by monotypy). New subjective synonymy.

Synonymy. This genus may be diagnosed by the same characters as the subfamily. A side-by-side examination of the type species of *Lophomus* and of *Troglotyla* revealed no differences significant enough to warrant recognizing both genera. In particular, the presence of an articulated coxal flagellum on the anteriomesial face of the posterior gonopod colpocoxite provides evidence for synonymizing the two names.

Lophomus laxus Loomis and Schmitt Figures 36, 37, 39

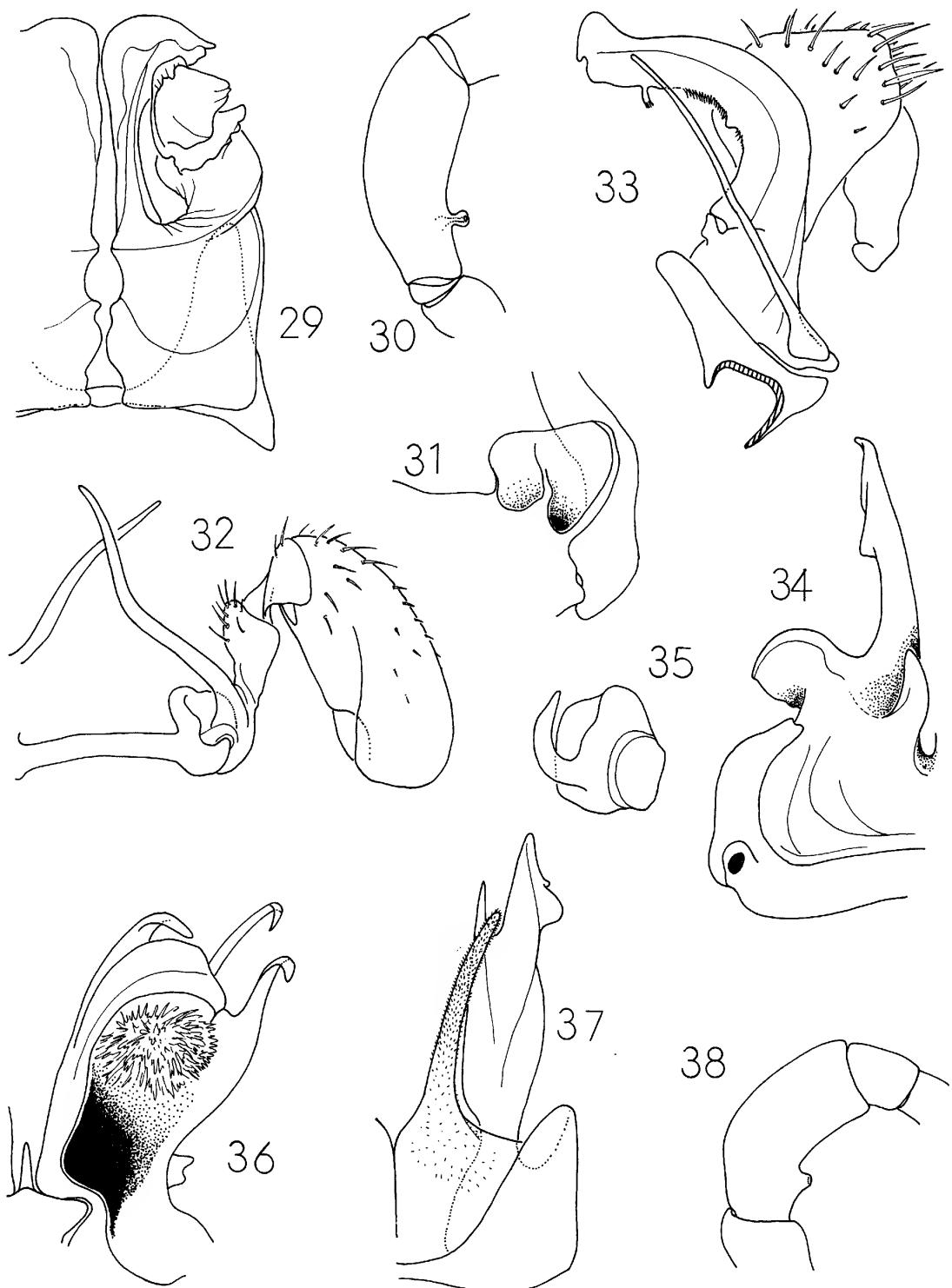
Lophomus laxus Loomis and Schmitt 1971, p. 125, figs. 22-25 (male holotype from Patee Canyon, Missoula Co., Montana deposited in USNM, examined).

The nonsexual characters of this species have been fully described by Loomis and Schmitt (1971). The anterior gonopods of the holotype (fig. 37) consist of two branches, the innermost smaller and covered with fine microsetae; the sternum goes up the lateral side of the gonopods as in the austrotylines. The posterior gonopods (figs. 36, 39) have an articulated coxal flagellum. The anterior surface was not depicted by Loomis and Schmitt (1971), but they showed the flagellum (by means of a dotted line, their fig. 25) as not being articulated. An articulated flagellum probably has an entirely different origin than an unarticulated one, the latter simply appearing as a branch of the colpocoxite, as in *Bollmanella* (Shear, 1974), the former a parallel development of the coxal solenite found in most polydesmoid families. The anterior male legs have knobs proximal on femora four and five. Legpair 11 is also strongly modified, with a large process, slightly sinuous, projecting from the pre-femur. Similar modifications may be found in a few *Taiyutyla* species. However, the coxae of legpairs 12 and 13 are also ventrally pointed in *L. laxus*.

Lophomus skamania (Causey), new combination Figures 34, 35, 38

Troglotyla skamania Causey, 1972, p. 27 (male holotype from Dead Horse Cave, 1 mi. NW of Trout Lake, Skamania Co., Washington, deposited in USNM, examined).

This species differs from *L. laxus* in having the anterior gonopods fused mesially and in the reduction of the anterior branch (fig. 34). The posterior gonopod colpocoxites are not as complex as in *L. laxus* (fig. 33), but bear the same type of articulated flagellum, and the first telopodite segment is much larger than the second, as in *L. laxus*. The femora of legpair four bear small knobs proximally; femora five are unmodified. The coxae of legpair seven (fig. 35)



have mesial hooks which are sharply curved anteriad. Eleventh leg modifications are like those in *L. laxus*, but less extreme.

Although probably a troglobite, this species is not a highly evolved one, as Causey (1972) suggested. It has also been recorded from a cave locality in Klickitat County, Washington.

SUBFAMILY AUSTROTYLINAЕ new subfamily

Type Genus. Austrotyla Causey, 1961.

Diagnosis. Typical 30-segmented conotylids with undivided mentum. Anterior gonopods much larger than posterior gonopod colpocoxites (except in *Corypus*), flattened, with mesoposterior branch. Posterior gonopod colpocoxites relatively small, simple, cupped anteriad around basal branch of anterior gonopods, or entire gonopod (*Corypus*).

Included genera. Austrotyla, Corypus, Idagona, Achemenides.

AUSTROTYLA CAUSEY

Austrotyla Causey, 1961, p. 260 (type species *Conotyla specus* Loomis, by original designation).

Sonoratyla Hoffman, 1961, p. 369 (type species *Conotyla montivaga* Loomis, by original designation).

Austrotyla montani Loomis and Schmitt
Figure 40

Austrotyla montani Loomis and Schmitt, 1971, p. 122 fig. 12 (male holotype from Missoula Co., Montana, junction of Clark Fork and Deep Creek, deposited in USNM, examined).

This species is clearly related to, but distinct from, *A. borealis* Shear, from Alberta. The anterior gonopods were not to be found in the holo-

type vial, which contained a single broken posterior gonopod colpocoxite, shown in mesial view in figure 40. The tenth and eleventh coxae of males of *A. borealis* lack lobes; the tenth coxae have lobes in *A. montani*.

CORYPUS LOOMIS AND SCHMITT

Corypus Loomis and Schmitt 1971, p. 123 (type species *C. cochlearis* Loomis and Schmitt).

This genus is distinct from *Austrotyla*, to which it obviously is closely related, in the proportions of the gonopods. In *Corypus* the posterior gonopod colpocoxites are larger than the anterior gonopods, while in *Austrotyla* the reverse is true.

Corypus cochlearis Loomis and Schmitt
Figures 41, 42

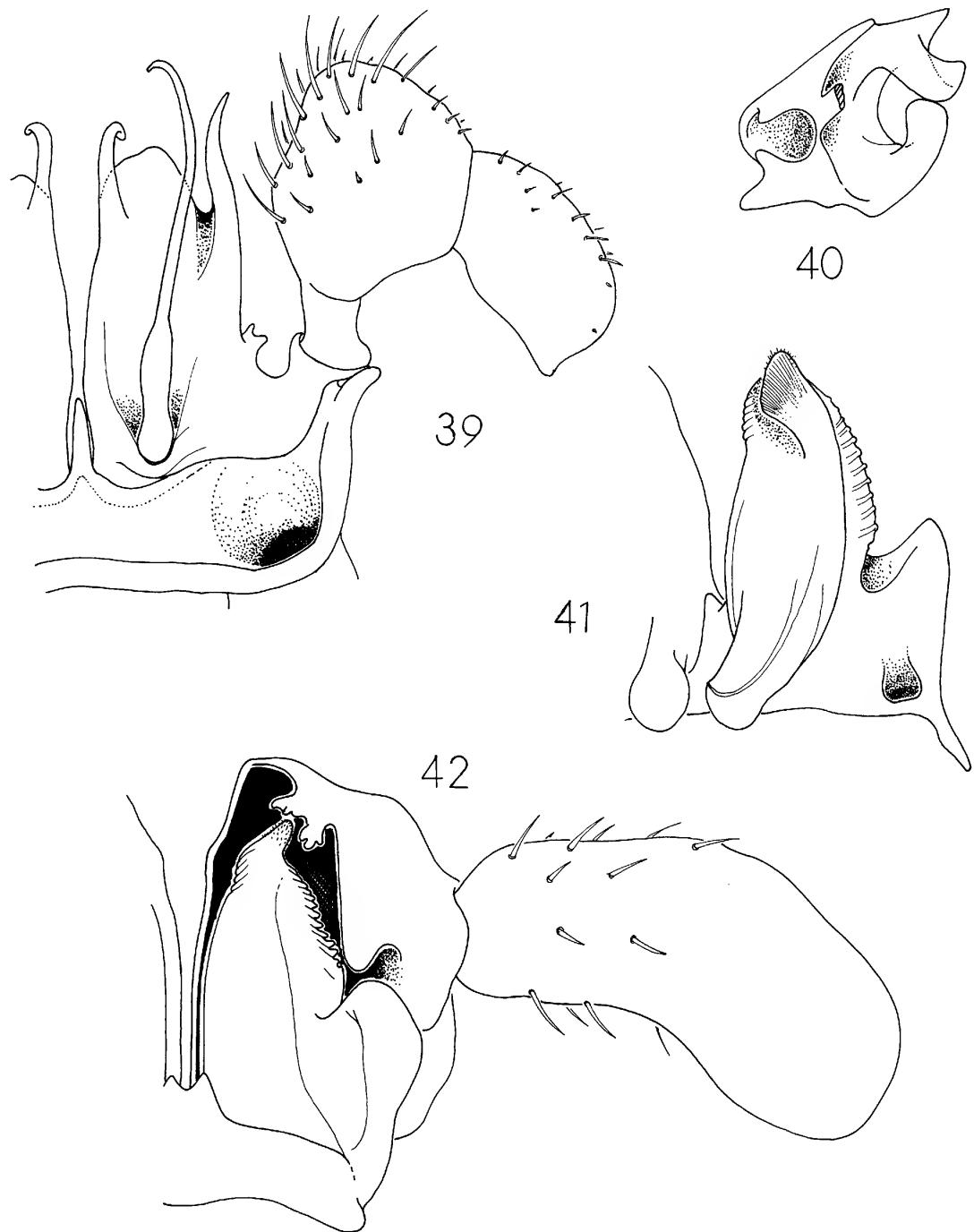
Corypus cochlearis Loomis and Schmitt, 1971, p. 123, figs. 16-18 (male holotype from Sanders Co., Montana, 2 mi. W of Noxon, deposited in USNM, examined).

Because of the proportions of the gonopods, this species could be considered the most primitive of the austrotylines, as it is most like the *Taiyutyla* plan. However, femora three and four are modified in typical austrotyline fashion, and the posterior gonopod colpocoxites (fig. 42) are cupped anteriad, receiving the posterior branch (fig. 41) of the anterior gonopods.

NOMINA DUBIA AND OBLITA

The status of the generic name *Cookella* and its type species *C. leibergi* (Cook and Collins) remains unsettled (Shear, 1971). The type was reported to be a female by Cook and Collins (1895), from Lake Pend d'Oreille, Idaho, and was deposited in the USNM, but could not be

FIGS. 29-38. Various conotylids. 29-32. *Macromastus marginandus*. 29. Left anterior gonopod, posterior view. 30. Femur of right leg six of male, posterior view. 31. Sternal process of posterior gonopods, posterior view. 32. Right posterior gonopod, anterior view. 33-35. *Lophomus skamania*. 33. Right posterior gonopod, mesal view. 34. Left anterior gonopod, anterior view. 35. Left male leg seven coxa, ventral view. 36, 37. *Lophomus laxus*. 36. Left posterior gonopod colpocoxite, posterior view. 37. Right anterior gonopod, anterior view. 38. Femur of right leg four of male *Lophomus skamania*, posterior view.



FIGS. 39-42. Various conotylids. 39. Right posterior gonopod of *Lophomus laxus*, anterior view. 40. Left posterior gonopod colpocoxite of *Austrotyla montani*, mesial view. 41, 42. *Corypus cochlearis*. 41. Left anterior gonopod, posterior view. 42. Right gonopod complex, anterior view.

located in that collection. According to Cook and Collins (1895), the mentum was divided, and on that statement Chamberlin (1941) erected the generic name *Cookella*, without ever seeing specimens. In 1971, I called the original observation of the mentum "mistaken," but had no evidence for doing so and withdraw the statement. However, it is unlikely that a species with typical conotylid body form would not have the typical undivided mentum of a conotylid. Until additional specimens from the type locality are available, the status of the name *Cookella leibergi* is in doubt.

Zygoptyla phana Chamberlin was described from Blue River, British Columbia, on the basis of a single immature male. The type has probably been lost, never having reached the designated depository, the British Columbia Provincial Museum. I am fairly sure it is a junior synonym of *Conotyla atrolineata* (Bollman), since this is the only conotylid to appear in several large collections from British Columbia.

"*Trichopetalum*" *glomeratum* Harger is probably a species of *Taiyutyla* or *Bollmanella*. The type is no longer in existence (it was from the John Day Valley, Oregon), and the description (Harger, 1872) is too vague to be of any use in placing the species. The name has not appeared in print since 1895, except in lists, and should probably be considered a *nomen oblitum*.

Loomis and Schmitt (1971) described two monotypic new genera, *Endopus* (type species *E. parvipes* Loomis and Schmitt) and *Orthogmus* (type species *O. oculatus* Loomis and Schmitt) in the family Trichopetalidae. However, the type species of both of the genera have undivided menta, which excludes them from the Trichopetalidae. I examined the holotypes of the two type species (USNM), and though they represent two different species, they are certainly not trichopetalids but immature male conotylids, lacking one molt of maturity (both holotypes have 28 body segments). It will probably prove impossible to synonymize these names properly, except by an arbitrary assignment, unless mature material can be gathered from the type localities. On the basis of the descriptions and distribution data given by Loomis and Schmitt (1971), I suggest that *E. parvipes* is a junior synonym of *Conotyla albertaina* Chamberlin, which Loomis

and Schmitt redescribed in the same paper (from adults) as *Brunsonia complexipes*.

LITERATURE CITED

Causey, Nell B.
 1961. *Austrotyla*, a new milliped genus (Chordeumidae: Conotylidae: Conotylinae). Proc. Biol. Soc. Washington, vol. 74, pp. 251-266, figs. 1-10.

1972. Two new conotylid millipeds from western North America and a key to the genus *Adrityla* (Chordeumida: Diplopoda). Proc. Louisiana Acad. Sci., vol. 35, pp. 27-32, figs. 1-9.

Chamberlin, Ralph V.
 1941. New western millipeds. Bull. Univ. Utah, Biol. Ser., vol. 6, no. 5, pp. 3-23, figs. 1-42.

1952. Two Oregon millipeds of the order Chordeumida. Nat. Hist. Misc. No. 113, 3 pp.

Cook, Orator F.
 1896. On recent diplopod names. Brandtia, II, p. 5-8.

Cook, Orator F., and George Collins
 1895. The Craspedosomatidae of North America. Ann. New York Acad. Sci., vol. 9, no. 1, pp. 1-100, figs. 1-97.

Harger, Oscar
 1872. Descriptions of new North American myriapods. Amer. Jour. Sci. Arts, ser. 3, vol. 4, pp. 117-121.

Hoffman, Richard L.
 1961. Systematic and morphological notes on North American conotyloid diplopods. Trans. Amer. Ent. Soc., vol. 87, pp. 259-272, figs. 1-7.

Loomis, Harold F., and Rupert Schmitt
 1971. The ecology, distribution, and taxonomy of the millipeds of Montana west of the continental divide. Northwest Sci., vol. 45, pp. 107-131, figs. 1-34.

Shear, William A.
 1971. The milliped family Conotylidae in North America, with a description of the new family Adritylidae (Diplopoda; Chordeumida). Bull. Mus. Comp. Zool., vol. 141, no. 2, pp. 55-96, figs. 1-81.

1972. Studies in the milliped order Chordeumida (Diplopoda): a revision of the family Cleidogonidae and a reclassification of the order in the New World. *Ibid.*, vol. 144, no. 4, pp. 151-352, figs. 1-538.

1974. The milliped genus *Bollmanella* (Diplopoda, Chordeumida, Conotylidae). *Psyche*, vol. 81, no. 1, pp. 134-146, figs. 1-22.

Verhoeff, Karl
1913. AscospERMophoren aus Japan. *Zool.* Anz., vol. 43, pp. 342-370, pl. 1, figs. 1-14.

1932. Diplopoden-Beitrage (124. Diplopoden-aufsatZ). *Zool. Jahrb., Syst. Arb.*, vol. 62, pp. 469-524, pl. 1, 2, figs. 1-30.

